REMARKS

In view of both the amendments presented above and the following discussion, the Applicants submit that none of the claims now pending in the application is obvious under the provisions of 35 USC § 103. Thus, the Applicants believe that all of these claims are now in allowable form.

If, however, the Examiner believes that there are any unresolved issues requiring adverse action in any of the claims now pending in the application, the Examiner should telephone Mr. Peter L. Michaelson, Esq. at (732) 542-7800 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Specification amendments

Various amendments have been made to the specification to correct minor inadvertent typographical errors that remained in the specification.

Status of claims

Independent claims 26, 48, 49 and 50 have been replaced by new independent claims 51, 53, 55 and 57, respectively. Each of the latter claims more precisely recites the present invention than did the claim it replaced.

Dependent claims 34 and 36 have been canceled; while dependent claims 27, 35, 37 and 44 have each been slightly amended.

New dependent claims 52, 54, 56 and 58 have been added.

Rejection under 35 USC § 103

The Examiner has rejected claims 26-50, as they stood prior to this action, under the provisions of 35 USC § 103 as being obvious over the teachings in the Johnson patent (United States patent 6,088,002 issued to T. Johnson et al on July 11, 2000) taken in view of those in the Tsui et al application (United States published patent application 2003/0003959 published on January 2, 2003). Inasmuch as all the independent claims 26 and 48-50 have now been canceled, this rejection is moot. Nonetheless, since these claims have been replaced by new independent claims 51, 53, 55 and 57, respectively, then, to expedite prosecution, this rejection will be discussed in the context of those new claims and particularly with respect to independent claim 51. In that context, this rejection is respectfully traversed.

Specifically, the Examiner takes the position that the Johnson et al patent discloses various elements of claim 26. Specifically, the Examiner states that the Johnson et al patent discloses:

> "a telecommunications radio system for mobile communication services (col 3, lines 1-5, radio, antenna system) comprising a first base station (col 1, lines 30-33, base stations; col 4, lines 1-5, radio tower) having a plurality of antennas and located at a site (col 4, lines 5-10, dipole antenna elements), wherein: the site comprises a structure with a height

> of at least 50m from erection ground (col 2, lines 43-49, antenna system is modular and can be configured, mast variants, thus the height of the structure can be varied and made greater than or equal to 50m); the base station is located on the site at a height of at least 50m from erection ground (col 4, lines 1-5, radio tower, col 2, lines 43-49, antenna system is modular and can be configured, mast variants, thus the height of the structure can be varied so that the tower/base station height is greater than or equal to 50m); and at least two of the antennas are arranged in a first ring situated in a first plane orthogonal to and concentric with a longitudinal axis of the site (col 3, lines 10-12, the outer ring of panels is connected to an inner ring, panel consists of vertical transformer beams on which dipole elements are mounted; orthogonal plane of the longitudinal axis implies vertical direction)."

The Examiner concedes that the Johnson et al patent does not teach the concept of a coverage area being subdivided into a multitude of sectors by the antennas. Given this deficiency, the Examiner turns to the Tsui et al application for these missing teachings, i.e. an antenna pattern partitioned into sectors to aid in efficiently increasing downstream transmission capacity. With his view of the teachings in the Johnson et al patent and the Tsui et al application, the Examiner then concludes that it would have been obvious to one of skill in the art at the time the present invention was made to have modified the teachings of the Johnson et al patent by those in the Tsui et al application and, by so doing, arrive at the present invention.

As the Examiner will soon appreciate, his view of the teachings in the Johnson et al patent as well as his overall conclusion of obviousness, at least with respect to

claim 51 (and all the other clams as they now stand), are both incorrect.

The Johnson et al patent, as the Applicants have discussed in their prior amendment mailed November 21, 2005, discloses a modular antenna system mounted on a supporting structure and for use with wireless communications. As shown in FIGs. 1-3 and described in, e.g., col. 2, line 43 et seq of this patent, the antenna system is formed of panels 5, between 1 - 20 in number, with each panel having 32 dipole elements 10 arranged in a 4-row by 8-column matrix. The panels are themselves arranged in a single closed outer ring 2 that is connected to inner ring 3 by horizontal beams or struts 4; the inner ring being connected, in turn, to mast 6. Each panel, effectively a phased array, consists of horizontal beams 7, vertical grid bars 8 and vertical transformer beams 9 with diploes 10 being situated on and connected to the beams. While multiple, apparently identical, closed rings of supporting members are shown, the antenna panels themselves are mounted, via struts 4, to these rings. As the Examiner can readily appreciate, this patent, specifically FIG. 1, shows only a single ring of identical antenna panels with identical antenna elements 10 used throughout all the panels. While multiple rings are clearly shown, only ring 2 is formed of antenna panels while all the remaining rings, including ring 3, are formed of physical supporting members.

A number of low wind antenna boxes 11 is situated within the mast and are enclosed by the inner ring. As indicated in col. 3, lines 22 et seq, these antenna boxes may contain "duplex filters, low noise amplifiers,

transmitter power amplifiers and combiners". Further, the antenna panels, specifically each reflector, may be varied as needed to accommodate various environmental (including weather) and physical factors, as indicated in col. 4, lines 57-65. These panels can be mounted on a building or mast.

Furthermore, for each panel, as indicated in col. 2, line 46 et seq, the vertical size and gain of that panel can be varied by using 2, 4 or 6 dipoles in each column on that panel and with different dipole row variants (presumably the number of dipoles per row) to accommodate specific frequencies, bandwidth, lobe tilt, null fill-up, connector location and wind area. All of these variations will have the same fixing (mounting) holes and location, and are thus selectable at installation or modifiable after installation if the network structure or traffic demand changes. See, col. 2, line 50 et seq.

In view of this, the Applicants again agree with the Examiner that the Johnson et al patent shows a base station and at least two antennas, with the base station being located at a site, and that the antenna system appears to be modular and readily reconfigurable.

However, directly contrary to the Examiner's view and as the Applicants also noted in their prior amendment, the Johnson et al patent contains absolutely no mention of the height to which the antenna system is to be mounted. In that regard, the Examiner again points to col. 2, lines 43-49 as teaching that "the antenna system is modular and can be configured, mast variants, thus the height of the

structure can be varied and made greater than or equal to 50m". Yet, the Applicants reiterate that while this portion of the specification of the Johnson et al patent does teach modularity and panel variants, this portion, set forth below, is totally devoid of any reference as to the proper height at which the entire antenna ring 2 should be mounted:

> "The antenna system is modular and can be configured by: Number of panels 1-20 for maximum gain and directionality. Mast or building mounted reflector variants with different environmental backlobe and wind loads. Vertical height and gain variations 2-4-(6) dipoles. Different dipole row variants for: frequency, bandwidth (BW), lobe tilt, null fill up, connector location, wind area."

The only reference to height is merely to the vertical dimension of each antenna panel itself and is based upon whether the panel contains 2, 4 or 6 rows of dipoles with obviously its vertical dimension increasing as more rows are used. As one can appreciate from FIG. 3, the vertical height (more aptly the vertical dimension, but not specifically marked) of the 4-row panel shown in this figure will be twice that for a similar 2-row panel but two-thirds of that for a similar 6-row panel.

There is absolutely no reference at all in this passage nor does any seem to be implied -- contrary to the Examiner's apparent belief, as to the height, above-ground, to which the entire antenna ring 2 is to be mounted on mast 6.

The Examiner, in asserting that the Johnson et al patent teaches that the base station is located at a height of at least 50 m above the ground, references the same

portion of the specification, i.e. col., 2, lines 43-49 and also col. 4, lines 1-5. Each of these portions of the specification fails to support the Examiner's assertion. The former portion is discussed immediately above. As to the latter portion, it expressly states:

> "The radio tower or mast is complemented with phased array antennas installed together with the *existing antennas* in order to permit continuous operation of the analog system during the installation of new hardware." [emphasis added]

Where in this passage is there any mention of the height of the base station on mast 6? In short, there is not any. It does not exist.

As to the height of the antennas themselves, not only does this latter passage provide no support, when viewed in the context of common knowledge in the art at the time, it actually teaches directly away from the Examiner's assertion. Specifically, this portion explicitly teaches that the inventive antenna panels taught by the Johnson et al patent, which can be implemented by phased array elements, are mounted together with existing, i.e. conventional, antennas. Why is this restriction important? Because, conventional wisdom at the time taught that base station cellular antennas had to be mounted at relatively low heights above the ground.

The height at which the Applicants teach that antennas for mobile cellular communications should be mounted and the nature and configuration of those antennas, when viewed in light of the rationale for doing so,

significantly distinguish the present invention from conventional approaches.

Specifically, the present Applicants note on pages 1-2 of the present specification, that, in practice, for cellular systems that rely on area sectorization (where a hexagonal cell area is divided into, for example, six sectors through the use of separate antennas), deviations from the theoretical and ideal sector shape regularly occur. These deviations are caused by landscape, traffic and non-ideal locations of a base station. Such deviations adversely affect cell and sector coverage and capacity.

Generally, a base station is located in the center of an area which it is to serve and, as such, divides that area into a maximum number of sectors, e.g., six. As the Applicants note, conventional wisdom in the art, is not to use high base stations because doing so would cause a considerable degree of undesirable interference between adjacent sectors and possibly between adjacent cells. Consequently, conventional approaches position base stations and their antennas relatively low to the ground, generally below 50m in height.

Recently, wireless carriers throughout the developed world have acquired licenses to operate UMTS (Universal Mobile Telecommunications System) networks and hence have a need to quickly build an extensive UMTS radio network covering at least relatively large cities in the developed world. Unfortunately, a considerable shortage exists of new locations that would be suitable for UMTS base stations. Moreover, for some locations that do exist,

difficulties arise in negotiating access to those existing locations that could suitably accommodate such a base station. Consequently, wireless carriers are experiencing a considerable loss of time as a result of having to co-ordinate their efforts with other parties as well as frequently re-plan their UMTS radio networks based on then available sites. Hence, current deployment of UMTS radio networks is only progressing at a rather slow pace and at significant financial cost to carriers. Compounding this problem is the fact, that, if base stations were to be physically sited in accordance with conventional teachings, i.e., using sectorized approaches with low height antennas as discussed above, then the resulting network will contain numerous holes (gaps) in coverage.

Advantageously and as discussed in page 4, line 19 et seq of the present specification, the Applicants have discovered -- quite contrary to conventional wisdom in the art -- a new approach to configuring base stations, in terms of height and antenna geometry, that permits use of a far greater range of sites than heretofore possible and can be deployed quickly and relatively inexpensively. The present invention can also accommodate any size or shape of any covered area and can easily change user capacity in that area. The invention is applicable to any mobile telecommunications system which relies on sectorization, namely, e.g., GSM, TDMA, CDMA and UMTS.

First, in accordance with the Applicant's inventive teachings, the antennas are located at relatively high heights, when compared to conventional arrangements. These heights are preferably at least 50m above erection

ground (ground-level of the antenna site), which, advantageously permits the base station to cover enlarged areas over conventional approaches and thus reduces the number of base stations otherwise needed to cover a larger geographical area. Doing so, by virtue of the increased height, also advantageously increases the likelihood of a clean line-of-sight signal between a mobile device and the base station reduces the incidence of multi-path propagation (typically caused by buildings) or interference caused by surrounding base stations that would otherwise occur.

Second, to achieve sufficient power flow density (typically in the range of -21 dBm) at ground level throughout an area serviced by a base station, the antennas are arranged in a multi-ringed arrangement. This arrangement relies on using at least two separate rings of antennas, i.e. inner and outer rings, where the outer ring has a larger diameter than the inner ring.

Third, the antennas used in the outer ring are configured such that they produce a denser sectorization than do the antennas used in the inner ring.

Illustratively, the inner ring may comprise 24 separate antennas that define 24 separate sectors, around 360 degrees of total coverage, with each antenna having a 15 degree horizontal annular range. The outer ring may illustratively comprise 72 antennas that define, again around 360 degrees of total coverage, 72 sectors with each having a 5 degree horizontal annular range. The vertical aperture angle of the inner antennas should be approximately 10 degrees and cover a distance range of 1 km - 3.2 km at

approximately 10 degrees of tilt, while the vertical aperture angle of the same antennas should be approximately 5 degrees and cover a distance range of 3.2km - 6.4km. This results in a sector area of about 1.33 square km. Applying just 10 Watts of transmitter power for each sector yields a desired and relatively uniform desired power flow density of -21 dBm through the coverage area of the base station. This level allows the base station to achieve adequate indoor coverage within its entire coverage area.

Advantageously, by virtue of using antennas that are sized to provide relatively small beam widths but with relatively high gain (i.e. resulting in high trunking gain), and positioning those antennas at a relatively high height (compared to conventional approaches), a single base station utilizing the present inventive teachings can cover a relatively large urban area -- more so than one which follows conventional wisdom in the art.

As to the Tsui et al application and as the Applicants discussed in their prior amendment mailed November 21, 2005, the Applicants agree with the Examiner's view that, to the extent relevant, the Tsui et al application teaches the known concept of sectorization, i.e. that antennas can be used to divide a coverage area into individual sectors. The Applicants' make no claim to sectorization in and of itself -- as that concept is very well established in the art and has been so well prior to the filing date of the Tsui et al application.

However, the Tsui et al application, just like the Johnson et al patent, is utterly devoid of any mention of

the height of base station antennas. Consequently, any combination of the teachings of the Tsui et al application with those in the Johnson et al patent would be constrained by the explicit teachings in the Johnson et al patent that the antennas would be mounted together with existing, i.e. conventional, antennas, which, when viewed in light of conventional wisdom in the art, means that the antennas would be mounted relatively low to the ground. This, in turn, would result in the very same problems discussed above and inherent in the art, including the Johnson et al patent, when applied to UMTS radio network deployment -- problems which are now advantageously solved by the present Applicants.

It remained for the Applicants and only the Applicants to remedy those problems.

The Applicants, through their independent claims, have now defined their present invention with added precision.

Claim 51 recites as follows:

> "A telecommunications radio system for mobile communication services comprising a first base station having a plurality of antennas and located at a site, the base station covering an area subdivided into a multitude of sectors by the antennas, wherein:
> the site comprises a structure with a height of at least 50m from erection ground;
> the base station is located on the structure at a height of at least 50m from erection ground; and
> the plurality of antennas having:
> a first set of the antennas arranged in a first ring situated in a first plane orthogonal to and

concentric with a longitudinal axis of the structure; and

a second set of the antennas arranged in a second ring situated in a second plane orthogonal to and concentric with the longitudinal axis of the structure, wherein the antennas in the second set are different from and greater in number than the antennas in the first set, such that the second ring of antennas provides denser sectorization than that provided by the first set of antennas."

As discussed above, and as expressly set forth in the claim, the present invention has three basic distinguishing aspects:

(a) the base station antennas located at a relatively high height above erection ground, i.e. at least 50 m above ground-level;
(b) a multi-ringed configuration of antennas, where the first (outer) ring has a larger diameter than the second (inner) ring; and
(c) the second ring employs more antennas than does the first ring such the second ring provides denser sectorization than does the first ring.

Where does the Johnson et al and/or Tsui et al references provide any teachings relating to antenna and base station heights above erection ground, let alone positioning both of these at respective heights of at least 50m? They do not. No such teachings exist.

Where does the Johnson et al and/or Tsui et al references provide any teachings related to a multi-ringed configuration of antennas? They do not. Johnson provides the only relevant teachings, with those teachings being

limited to just one single ring of antennas mounted concentric with a longitudinal axis of a mast, hence falling quite short of this feature of the Applicants' invention.

Where does the Johnson et al and/or Tsui et al references provide any teachings related to configuring the inner ring of antennas such that it provides increased sectorization over that provided by the outer ring? They do not. No such teachings exist.

Accordingly, as the Examiner can well see, the rather limited teachings in both the Johnson et al and Tsui et al references stop far short of suggesting the presently claimed invention to a person of skill in the art. Clearly, then, a person of skill in the art when faced with the teachings in these two references would not and could not extend them as far as the Examiner would like to yield the invention as recited in claim 51. Moreover, as discussed above, certain of those teachings which do exist contradict the Applicants' inventive teachings -- which further undercuts any view that the invention recited in that claim would be obvious in view of any combination of the teachings in these two references, regardless of how those teachings are to be combined.

Similar distinguishing recitations appears in each of the Applicants' other independent claims, to wit, claims 53, 55 and 57.

Accordingly, the Applicants submit that each of their independent claims is not rendered obvious by the

teachings in the Johnson et al patent and the Tsui et al application.

Each of the remaining claims, specifically 27-33, 35, 37-47 and 52, depends from a corresponding one of independent claims 51, 53, 55 or 57, and recites further distinguishing features of the invention over that recited in that independent claim. Consequently, the Applicants submit that each of their dependent claims, as they now stand, is not rendered obvious by the teachings in the applied references for the same exact reasons as is its corresponding independent claim.

Thus, the Applicants submit that none of the claims, presently in the application, is obvious in view of the teachings of the applied references. Hence, all of these claims are patentable under the provisions of 35 USC § 103.

Conclusion

Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

Respectfully submitted,

August 21, 2006

Peter L. Michaelson, Attorney
Reg. No. 30,090
Customer No. 007265
(732) 542-7800

MICHAELSON & ASSOCIATES
Counselors at Law
P.O. Box 8489
Red Bank, New Jersey 07701-8489

CERTIFICATE OF MAILING under 37 C.F.R. 1.8(a)

I hereby certify that this correspondence is being deposited on **August 22, 2006** with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to the Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Signature

30,090
Reg. No.

(PTT199RCEPREAMEND082106/ca:Sitka)